

# Research on the Construction of Emergency Logistics System in Dalian

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## Abstract

Emergency logistics system is the guarantee of efficient and smooth flow of emergency materials. This paper studies the emergency logistics system of Dalian city by investigation, literature research and qualitative analysis. According to the research, there are some shortcomings in Dalian emergency logistics system, such as the lack of permanent institutions, multi-party linkage and response mechanism, policy guarantee and information platform jointly built by multiple parties. On the basis of summarizing the experience and lessons of emergency logistics system in major public emergencies, especially the COVID-19 epidemic, the paper builds the “government, enterprise, military and civilian” closely coordinated emergency logistics system, and puts forward guarantee suggestions for the smooth operation of the system in terms of emergency logistics policies, regulations, ideas and information platform.

## Keywords

Dalian City, Emergency Logistics System, Public Information Platform for Emergency Logistics

## 1. Introduction

As an important part of the emergency material support system, the emergency logistics system plays a pivotal role in various public emergencies. However, in the face of the COVID-19 epidemic, many deficiencies such as poor operation of the emergency logistics system and serious material chain loss had been exposed. At the 12th meeting of the Commission for Comprehensively Deepening the Reform of the CPC Central Committee in February 2020, General Secretary Xi Jinping stressed the need to improve the unified emergency materials guarantee system, and the emergency materials support should be taken as an important

part of the construction of the national emergency management system. This means that all provinces and cities must attach great importance to the construction of the emergency guarantee system, strengthen the top-level design, study and build an efficient emergency logistics system to better nip it in the bud.

Although Dalian is not the key area of the epidemic, as a coastal city, Dalian is in a region prone to natural disasters such as tsunami and typhoon. In addition, Dalian has a large number of major hazard sources, and a high risk of production safety accidents. Once there is an emergency, the procurement, transportation, distribution, storage, recycling and other links of emergency materials must be completed efficiently through the emergency logistics system. Especially in the modern society with highly developed information technology, the construction of emergency logistics system for Dalian will be of great significance to promote the rapid response, efficient operation and sustainable development of emergency logistics. Although this paper has built an emergency logistics system for Dalian from a theoretical point of view, the system still has many obstacles to the specific application of government system, the complexity of emergency logistics information system.

The article is organized as follows: First of all, the paper investigates the current situation and existing shortcomings of Dalian emergency logistics system; Then, the paper puts forward the principles and goals of building an emergency logistics system in Dalian City; Thirdly, the paper has built an emergency logistics system for Dalian City, which is also the core content of the paper; Finally, the paper puts forward guarantee suggestions for the smooth operation of emergency Dalian logistics system.

## 2. Literature Review

In recent years, experts and scholars' research on emergency logistics mainly focuses on the following aspects: 1) Research on the optimization of material allocation in emergency logistics. Most scholars optimize the distribution route of emergency materials from a quantitative perspective through mathematical modeling. Zhang Wei et al. have established a multi-target non-linear mixed integer planning model to optimize the emergency logistics path (Zhang, Yang, & Zhu, 2017). Zhou Haixia and others have built a two-layer planning model to solve the problem of transportation path optimization of post-disaster emergency logistics (Zhou, Mei, Lv, & Sun, 2020). 2) Research on the construction of the emergency logistics system. Scholars mainly study the construction of emergency logistics system from the purpose, principles and construction ideas. Yuan Qiang and others put forward the idea of establishing China's "government, enterprise, military, civilian" emergency logistics system (Yuan, Zhang, & Chen, 2020). Zhou Jingyu and others have studied the construction path of the military-civilian integrated emergency logistics system (Zhou and Yang, 2019). 3) Research on the current situation, problems and countermeasures of emergency

logistics. Scholars mainly discuss the existing problems and coping strategies of domestic emergency logistics from the perspective of the whole country. Xu Dong summarized China's emergency logistics problems as "six deficiencies", and gave suggestions from the perspective of operation mechanism and information platform (Xu, 2020). Li Xudong and others explored the countermeasures of applying blockchain technology to improve emergency logistics under public health emergencies (Li, Wang, & Wang, 2020). 4) Research on the concepts, characteristics and classification of emergency logistics. The concept of emergency logistics has not yet been unified, but most scholars believe that emergency logistics has four basic characteristics. Xue Liang believes that emergency logistics refers to the rapid logistics supply activities in response to emergencies (Xue, 2020). Chen Tai et al. believe that emergency logistics has the characteristics of sudden, uncertainty, weak economy and unconventional (Chen, Wei, & Ni, 2020).

To sum up, most scholars have carried out the research on emergency logistics from the perspective of the whole country, and there is still little research on the construction of emergency logistics system in a certain city. Therefore, the construction of emergency logistics system in Dalian has positive theoretical significance and practical value.

### **3. The Current Situation and Existing Shortcomings of Dalian Emergency Management System**

According to the research information, in response to the epidemic, tsunami and other emergencies, the Dalian Municipal People's Government has set up a number of departments, including Municipal Emergency Response Bureau, Civil Affairs Bureau, Municipal Bureau of Commerce, Municipal Commission of Health, etc. In case of an emergency event, the procurement, storage and distribution of emergency materials are carried out by different departments. The Municipal Health Commission shall be responsible for the medical materials; the Commerce Bureau shall be responsible for the tent materials for disaster relief; the Civil Affairs Bureau is mainly responsible for production safety, and the emergency materials shall mainly include gas masks, fire suits, charge boats and other disaster prevention and mitigation equipment. In addition, those with low value of emergency materials needed by various departments are purchased by themselves, and those with higher value will be publicly purchased by the government. To sum up, the Dalian emergency logistics system has the following shortcomings:

1) Dalian City lacks a permanent organization of unified management of emergency logistics

Although the Dalian Municipal Government has set up the Municipal Emergency Administration, there is no permanent logistics-related organization in the Municipal Emergency Administration. After the occurrence of public emergencies, the procurement, storage and distribution of emergency materials are

usually participated by multiple departments, such as the Municipal Emergency Response Bureau, the Civil Affairs Bureau, the Municipal Bureau of Commerce, the Municipal Health Commission, etc. Due to the scope of functions and powers, all departments fight separately, which cannot form a more efficient joint force urgently needed for emergency events in the short term, and it is difficult to realize the safety and smoothness of emergency logistics management.

In addition, as a special logistics activity, emergency logistics involves many administrative departments across provinces and even cross-border boundaries, and needs the extensive participation of the government, the military, enterprises and institutions, grass-roots community organizations and the people. And its specific operation involves the generation of emergency materials, procurement, reserve, transportation, distribution and other links. However, the Dalian emergency materials support system lacks logistics professionals, so it is difficult to carry out scientific planning and unified command of the emergency logistics system, thus greatly reducing the efficiency of emergency logistics.

2) Dalian City lacks a multi-party emergency logistics linkage response mechanism

Although the official website of Dalian Municipal Emergency Management Bureau pointed out that one of its main responsibilities is to uniformly coordinate and command all kinds of emergency teams, establish an emergency linkage mechanism, promote the docking of various information platforms, and connect the troops to participate in emergency rescue work. However, due to there is no emergency logistics department, the lack of emergency logistics personnel and logistics information platform jointly built by various parties, once emergency events occur, the emergency logistics system is prone to multiple command and individual fighting, which will seriously restrict the effective coordination and cooperation of all parties and seriously affect the efficiency of emergency logistics.

3) Dalian City lacks the policy guarantee of emergency logistics management

The smooth operation of emergency logistics needs the effective cooperation of the government, the military, enterprises, communities and other subjects, and is easily affected by the policies of various aspects, such as personnel control, traffic control and cooperation mechanism between the government and enterprises and institutions. There are widespread decentralization, fragmentation and low levels of laws and policies for emergency logistics in Dalian and even the whole country. At the same time, there are still a large number of legal gaps. Many emergency bills are the products of emergency situations which are lack of fundamental emergency logistics laws and regulations as reference and guidance. The policy basis needed by emergency logistics is seriously insufficient, which easily leads to the “one size fits all” control measures in various places, which and then seriously affects the effective development of emergency logistics.

4) Dalian City lacks a logistics information platform jointly built by multiple parties

Logistics informatization is the foundation of modern logistics development,

and the logistics information platform is an important guarantee for the efficient operation of emergency logistics. The emergency management information platform currently built by Dalian Emergency Management Administration Bureau does not reflect the emergency logistics business. There is no centralized place for various information of emergency logistics, such as material supply and demand information, logistics resource information, channel and transportation information, which means that the emergency decision-making organs cannot focus on finding and dealing with problems from the independent perspective of logistics, and then make effective decisions.

## **4. The Main Contents of Building Dalian Emergency Logistics System from the Perspective of Big Data**

### **4.1. Objectives and Principles of Dalian to Build Emergency Logistics System**

#### 1) The construction goal of Dalian emergency logistics system

Dalian emergency logistics system should have the logistics needs to respond to four kinds of emergencies, including natural disasters, accidents, public health events and social security incidents. It should not only “have things to flow”, but also “flow freely” to ensure the efficient circulation of emergency materials. Therefore, Dalian emergency logistics system should pay attention to the top-level design, strengthen the construction of emergency logistics public information platform; ensure that various emergency logistics plans before the disaster, have strong logistics support capacity in the disaster, and summarize the experience to constantly improve the emergency logistics capacity after the disaster.

#### 2) The Construction Principles of Dalian emergency logistics system

The construction of Dalian emergency logistics system should follow the following principles: a) Systemic planning and overall planning of management. As far as the emergency material support system is concerned, the capacity of Dalian and even China in all links is gradually improved, but the system construction is not enough. Dalian should build an efficient emergency logistics system to ensure that the production, procurement, reserve, transportation, distribution, distribution and other links of emergency materials in the system are inter-related, designed integrated, being systematically operated and managed as a whole, so as to maximize the efficiency. b) Government-led, multi-party participation. Due to the characteristics of emergency, uncertainty, and demand diversity, time urgency and weak economy (Xue, 2020), the construction of emergency logistics system needs to participate in the material supplier, material demand party, logistics provider and other forces under the leadership of the government. c) Combine peacetime and war, save resources. Emergency logistics aims at the minimum personnel and property loss caused by emergencies, rather than the optimal logistics input-output ratio. However, in view that the emergency is a small probability event, the emergency logistics system cannot ignore

the economy in construction, and needs to combine peacetime and wartime and make full use of the existing social logistics resources.

### 4.2. Construction Path of Emergency Logistics System in Dalian City

According to the above goals and principles, and combined with the existing government organization structure and the current situation of the emergency material support system in Dalian City, an emergency logistics system closely coordinated with “government, enterprise, military and people” (Yuan, Zhang, & Chen, 2020) is constructed (see Figure 1). Dalian emergency logistics system is composed of four categories of participants, including logistics management department, emergency material suppliers, emergency material demanders and emergency logistics operators, and a public emergency logistics information platform.

#### 1) Emergency logistics public information platform

Emergency logistics information platform is the information center of Dalian emergency logistics system, and also the information command center for the logistics management department to make decisions on emergencies. The platform is a place for logistics-related information such as emergency materials, logistics resource, road resource, and related policies. Relying on this information platform, the logistics decision-making departments can reasonably match the material supply and demand information and logistics information, make

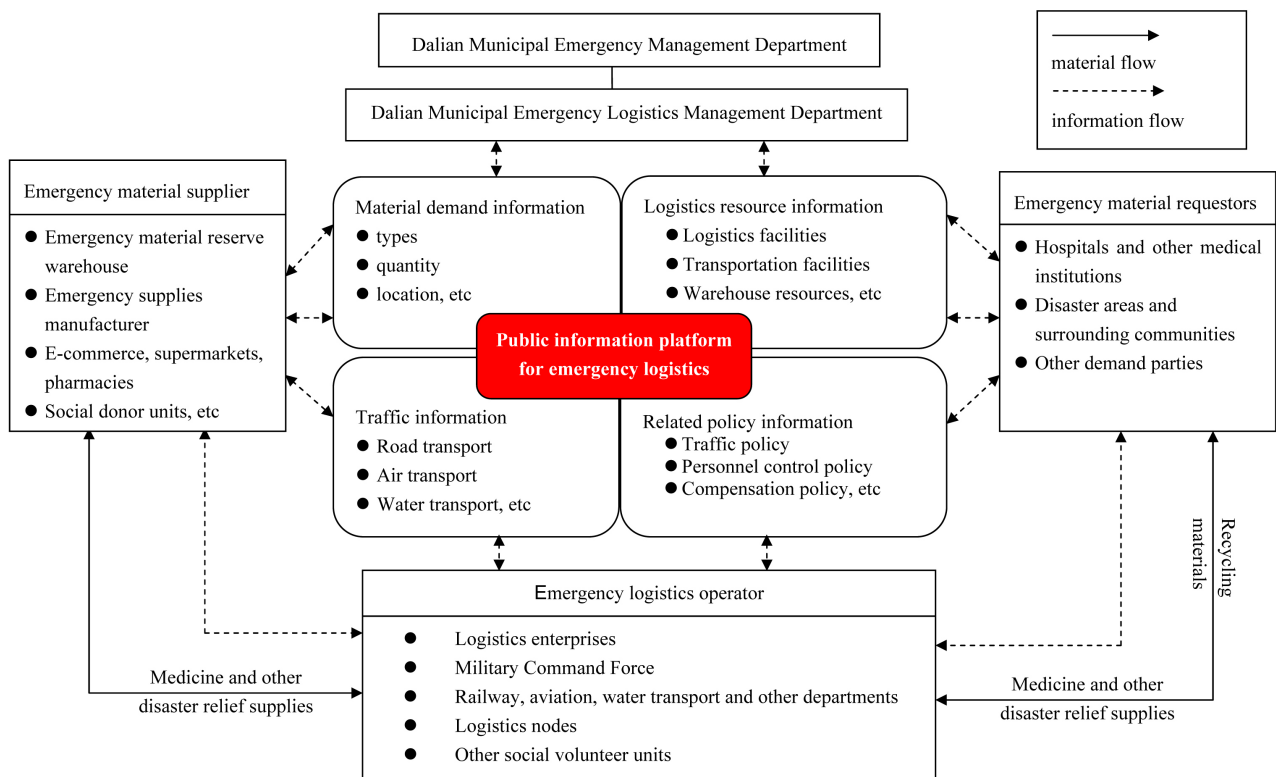


Figure 1. The emergency logistics system involving “government, enterprise, military and people”.

overall arrangements, and implement unified scheduling, so as to maximize the benefits of the whole emergency logistics system.

In order to achieve the above goals, the construction of Dalian emergency logistics information platform must inevitably make use of modern data technologies such as big data, Blockchain, Internet of Things and artificial intelligence. While collecting information related to emergency logistics, these information technologies can conduct in-depth excavation, analysis and accurately predict all kinds of information, efficiently match the supply and demand of emergency materials, automatically complete logistics route planning and route optimization, and assist decision-making departments in making intelligent decisions. The whole system finally achieves the coordination of “government, enterprise, military and people”, realize the efficient coordination of various operation links such as production, procurement, reserve, transportation and distribution of emergency materials, and accelerate the intelligent operation of emergency logistics.

In addition, in line with the principle of “saving resources”, the construction of Dalian emergency logistics information platform focuses on the integration of existing information system resources. It includes not only the relevant emergency logistics information system independently developed or invested by Dalian Municipal Government in the early stage, but also the information system used by relevant industry organizations and advanced logistics enterprises. Blockchain technology (Li, Wang, & Wang, 2020) can be used to enable the existing information system of “government, enterprise, military and people” to be embedded in the Dalian emergency logistics public information platform, and strive to share information from all parties in real time.

### 2) Dalian Municipal Emergency Logistics Management Department

The emergency logistics management department of Dalian is the decision maker and commander of the emergency logistics system. The department should be the permanent organization, and can be composed of professionals from government, enterprise and military parties proficient in the operation and management of the emergency logistics. The department should not only according to the relevant logistics information to make emergency material deployment plan, but also do a good job in the coordination and dispatch of the “government, enterprise, military and people” parties, to ensure that the production, procurement, reserve, transportation, distribution, distribution and other links of emergency materials to form a complete system.

In addition, in line with the principle of “combining peacetime and wartime, saving resources”, Dalian emergency logistics management department besides fixed members, can recruit some senior logistics management consultants from enterprises and troops. These personnel can not only accumulate experience by managing the logistics business of their enterprise or troops; but also advise on the formulation, command and dispatch of emergency logistics plans at the event of emergencies.

### 3) Emergency material supplier



The emergency material supplier mainly refers to the emergency material storage and production enterprises, e-commerce, supermarkets, pharmacies, social donors, etc. that can quickly respond to the call of the Dalian emergency logistics management department to provide emergency materials for the emergency that occurs. They are the shippers of the emergency logistics system. In the operation process of the whole emergency logistics system, their main responsibility is to complete the preparation of emergency materials and deliver them to the logistics operator.

In the above emergency material suppliers, in addition to the government emergency material reserve, Dalian municipal government can establish a diversified emergency material reserve mode (Fu, 2020), such as signing with the enterprise reserve agreement, joint reserve agreement or enterprise reserve, etc., which not only can ensure the continuous supply production of emergency materials, but also can reduce the reserve cost.

#### 4) The demand party of emergency materials

The demand party of emergency materials mainly refers to the hospitals, other rescue parties and residents in urgent need of emergency materials. They are the receiving party of the emergency logistics system. In the operation process of the whole emergency logistics system, the main responsibility of the emergency material demand party is to report the types, quantities and locations of emergency materials as accurately as possible according to the emergency logistics public information platform through the relevant government standards.

#### 5) Emergency logistics operator

Emergency logistics operators mainly refer to logistics enterprises, military area troops, railway, aviation, water transportation and other departments. Under the command of the emergency logistics management department of Dalian City, they quickly and efficiently transfer emergency materials from the place of supply to the place of demand. In the operation process of the whole emergency logistics system, the main responsibility of the emergency logistics operator is to receive the emergency materials, reasonably allocate the load, choose the most appropriate transportation modes, means, routes and logistics nodes, etc., and deliver the materials to the hospital and other demand parties in the community at the fastest speed. Since the emergency logistics operation has both state-owned logistics enterprises such as military troops, railway departments, aviation companies etc., and private logistics enterprises, therefore, in the process of emergency logistics operation, it is vital to effectively integrate logistics resources and realize the multi-party linkage of "government, enterprise, military and people".

At present, in terms of emergency material support, the cooperation between the government and private logistics enterprises is only in the stage of spontaneous cooperation, and has not yet reached the degree of conscious cooperation. The emergency logistics management department of Dalian can establish corresponding mechanisms to integrate private logistics resources. On the one hand, encourage them to actively participate in the emergency guarantee work through incentive policies and economic compensation, and on the other hand,



restrain them through the corresponding assessment mechanism. In the event of emergencies, the government can not only require logistics enterprises to fulfill their social responsibilities, but also give direct economic compensation or indirect preferential policies to ensure that enterprises have sufficient motivation to participate in emergency material support.

## 5. The Guarantee Suggestion for the Smooth Operation of Dalian Emergency Logistics System

1) Dalian City should unify the laws, policies and system standards in emergency logistics (Xu, 2020)

Combined with national laws and regulations, improve the relevant regulations, policies and institutional standards of emergency logistics in Dalian. Dalian city needs to establish and improve military-civilian integration guarantee, social forces mobilization and compensation, emergency guarantee normalized drills and assessment mechanism, so that there are laws to abide by the emergency logistics in command process, unit coordination, the division of responsibilities, mobilization compensation, third party evaluation, and also make “government, enterprise, army, people” in the logistics resources integration has operational standards.

2) Dalian City should establish the concept of “emergency logistics”

According to the preliminary research results, we show that Dalian is still in the traditional stage of separate material security, which shows that the concept of “emergency logistics” has not been really established. Dalian should attach great importance to the professionalism and scientific nature of emergency materials guarantee, establish the concept of “emergency logistics”, use the systematic theory of thought, and reasonably plan all the links of the production, procurement, reserve, transportation, transit, distribution and distribution of emergency materials, so as to ensure the smooth operation of the emergency logistics system in Dalian.

3) Dalian city should speed up the construction of emergency logistics public information platform

The emergency logistics public information platform is the information center for Dalian emergency logistics management department to grasp the specific information such as emergency material supply, demand and quantity in real time, and make correct emergency logistics decisions with the help of the platform. Only by speeding up the construction of Dalian emergency logistics public information platform can we ensure that the emergency material supply, dispatch, distribution and other links are closely connected and efficient operation in the event of emergencies. Dalian can integrate the existing information platforms of logistics enterprises, the government and the army, and build an emergency logistics information platform jointly built by various parties as soon as possible. At the same time, Dalian emergency logistics public information platform should be a sub-system of Liaoning Province or the national emergency logistics information platform, and should leave the corresponding port during construc-

tion, so as to access the higher first-level emergency logistics information platform when needed.

4) Dalian City should strengthen the teaching, scientific research and social publicity in emergency logistics

Dalian should rely on universities, research institutes and logistics industry organizations to carry out extensive teaching and scientific research in emergency logistics, increase the training and drill of professional emergency logistics education, scientific research project approval and professional teams, and reserve professionals for the smooth operation of the emergency logistics system in the case of an emergency. In addition, Dalian should carry out planned and regular emergency logistics publicity for the whole society, so that the concept of “emergency logistics” is deeply rooted in people’s hearts.

## 6. Conclusion

Emergency logistics plays an increasingly important role in COVID-19 and other emergencies. In order to improve the guarantee capacity of emergency materials in Dalian, it is of important theoretical significance and practical value to explore the construction of emergency logistics system. In view of the current situation and existing shortcomings of emergency management in Dalian, the article constructs an emergency logistics system closely integrating “government, enterprise, military and people” covering the whole process of production, procurement, transportation, reserve, distribution and distribution of emergency materials. The article also puts forward guarantee suggestions for the smooth operation of the emergency logistics system in Dalian from the aspects of the unified policies and regulations of emergency logistics, establishing the concept of “emergency logistics”, accelerating the construction of the public information platform for emergency logistics, and strengthening the teaching, scientific research and social publicity of emergency logistics.

## Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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